

Serial No. 10/646,202

Amendments to the Claims

1. (currently amended) An interferometer for use in an OCDR or OCT imaging system to image a sample, comprising:

- a low coherence optical radiation source;
- a first beamsplitter having a first input connected to receive optical radiation from the low coherence optical radiation source;
- a single nonreciprocal optical element, ~~said the single~~ nonreciprocal optical element having a first input connected to receive optical radiation from a first output of the first beamsplitter, a first output for directing optical radiation from the first input to a sample to be imaged, a second input connected in common with the first output for receiving optical radiation reflected by the sample, and a second output for receiving optical radiation from the second input;
- a second beamsplitter having a first input connected to receive optical radiation from the second output of the single nonreciprocal optical element; and
- an optical radiation detector connected to receive optical radiation from the second beamsplitter; and

wherein the first beamsplitter has a second output providing optical radiation in a path leading to the optical radiation detector via a reference arm, and wherein the optical path excludes a nonreciprocal optical element.

2. (currently amended) The interferometer of claim 1, further comprising:

- a transmissive delay element having an input connected to receive optical radiation from ~~a the~~ second output of the first beamsplitter, and an output connected to second input of the second beamsplitter.

3. (currently amended) An The interferometer of claim 1, for use in an OCDR or OCT imaging system to image a sample, comprising:

- a low coherence optical radiation source;

Serial No. 10/646,202

a first beamsplitter having a first input connected to receive optical radiation from the low coherence optical radiation source;

a single nonreciprocal optical element, said nonreciprocal optical element having a first input connected to receive optical radiation from a first output of the first beamsplitter, a first output for directing optical radiation from the first input to a sample to be imaged, a second input connected in common with the first output for receiving optical radiation reflected by the sample, and a second output for receiving optical radiation from the second input;

a second beamsplitter having a first input connected to receive optical radiation from the second output of the nonreciprocal optical element; and

an optical radiation detector connected to receive optical radiation from the second beamsplitter; and

wherein a second output of the first beamsplitter is connected for directing optical radiation onto a reference delay element and for receiving optical radiation reflected from the reference delay element, a second input of the first beamsplitter connected for directing optical radiation to a second input of the second beamsplitter.

4. (original) The interferometer of claim 1, wherein the optical radiation detector comprises first and second optical radiation detectors, the first optical radiation detector connected to receive optical radiation from the first output of the second beamsplitter and the second optical radiation detector connected to receive optical radiation from a second output of the second beamsplitter.

5. (original) The interferometer of claim 4, wherein the first optical radiation detector and second optical radiation detector are connected to form a differential detector.

Serial No. 10/646,202

6. (original) The interferometer of claim 1, wherein the first beamsplitter is an unbalanced beamsplitter which delivers at least 85% of the optical radiation received at the first input to the first output.

7. (currently amended) The interferometer of claim 1, wherein the nonreciprocal optical element comprises an optical circulator.

8. (original) The interferometer of claim 7, wherein the optical circulator comprises a Faraday rotator and a polarizing beamsplitter.

9. (original) The interferometer of claim 1, wherein at least one of the first and second beamsplitters is an unbalanced beamsplitter.

10. (currently amended) The interferometer of claim 1, wherein the optical radiation detector comprises a first optical radiation detector connected to receive optical radiation from a first output of the second beamsplitter and a second optical radiation detector connected to receive optical radiation from a second output of second the beamsplitter.

11. (original) The interferometer of claim 10, wherein the first optical radiation detector and second optical radiation detector are connected to form a differential optical radiation detector.

12. (cancelled)

13. (currently amended) The interferometer of claim 12, wherein the optical radiation in the reference arm is in a range for shot-noise limited detection.

Serial No. 10/646,202

14. (original) The interferometer of claim 13, wherein the reference arm includes at least one of a reflective reference and a transmissive delay line.

15-17. (cancelled)

18. (currently amended) An The interferometer of claim 16, further system for imaging a sample at a sample location, comprising:

an optical radiation source, a first beamsplitter, an optical circulator and an optical detector; a first optical path extending from the optical radiation source, through the first beamsplitter, through a first portion of the first optical circulator to a sample location, and from the sample location through a second portion of the optical circulator to the optical detector;

a second beamsplitter positioned between the optical circulator and the optical detector along the first optical path; and

a second optical path extending from the optical radiation source, to a reference location, from the reference location through the first and second beamplitters to the optical detector.

19. (original) An interferometer for use in an OCDR or OCT imaging system to image a sample, comprising:

a low coherence optical radiation source;

a first beamsplitter having a first input connected to receive optical radiation from the low coherence optical radiation source;

said first beamsplitter having a first output for providing optical radiation from the first input to a sample to be imaged, and a second output for providing optical radiation in a reference arm including a nonreciprocal optical element and a reference element;

a second beamsplitter having a first input connected to receive optical radiation transmitted by the sample and a second input connected to receive optical radiation from the reference arm via the nonreciprocal optical element; and

Serial No. 10/646,202

an optical radiation detector connected to receive optical radiation from the second beamsplitter.

20. (currently amended) An interferometer for use in an OCDR or OCT imaging system to image a sample, comprising:

a low coherence optical radiation source;

a first beamsplitter having a first input connected to receive optical radiation from the low coherence optical radiation source;

said first beamsplitter having a first output for providing optical radiation from the first input to a sample to be imaged, and a second output for providing optical radiation in a reference arm including a transmissive delay line;

a second beamsplitter having a first input connected to receive optical radiation transmitted by the sample and a second input connected to receive optical radiation from the reference arm via the ~~nonreciprocal optical element~~ transmissive delay line;

and

an optical radiation detector connected to receive optical radiation from the second beamsplitter.

21. (original) An interferometer system for imaging a sample at a sample location, comprising:

an optical radiation source, a first beam splitter connected between the optical radiation source and a sample location for transmitting optical radiation from the optical radiation source to the sample location and for transmitting optical radiation to a reference arm;

a second beamsplitter for receiving optical radiation transmitted by the sample and directing at least some of such optical radiation to an optical detector;

the reference arm including an optical circulator and a reference element; and

the second beamsplitter directing at least some of the optical radiation from the reference arm to the optical detector.

Serial No. 10/646,202

22. (currently amended) An interferometer system for imaging a sample at a sample location, comprising:

an optical radiation source, a first beam splitter connected between the optical radiation source and a sample location for transmitting optical radiation from the optical radiation source to the sample location and for transmitting optical radiation to a reference arm;

a second beamsplitter for receiving optical radiation transmitted by the sample and directing at least some of such optical radiation to an optical detector;

the reference arm including a ~~transmissive delay line~~ reflective reference element; and

the second beamsplitter directing at least some of the optical radiation from the reference arm to the optical detector.

23. (new) An interferometer system comprising:

a low coherence source;

a pair of beamsplitters, the first beamsplitter directing light to and receiving light from a reference and the second beamsplitter receiving light representative of characteristics of a sample and of such reference and directing such light to a detector; and

a circulator/nonreciprocal optical element receiving light from the first beamsplitter, passing light to a sample and receiving light from the sample and passing it on to the second beamsplitter.